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Development of a High Intensity Yb:YAG Pumped Optical Parametric Chirped Pulse Amplification Laser System

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High intensity laser systems are finding many new applications in MeV to GeV particle generation and acceleration to Fast Ignition pulses for Laser Fusion Energy Drivers. In some cases, in order to enhance the electric fields associated with the laser plasma interactions longer wavelengths are advantageous. Thus, there is considerable interest in the development of high intensity systems in the infrared part of the spectrum. In the current study we are developing a TW class optical parametric chirped pulse amplifier (OPCPA) system. The pump laser for this system will consist of a femtosecond Yb:glass oscillator which will be stretched to the order of 100ps and amplified in a diode pumped Yb:YAG ceramic slab amplifier system up to an energy of around 2 J. A seed pulse for the OPCPA system at a wavelength of around 1500nm will be created from white light continuum generated from the femtosecond pulse after amplification to the microjoule level. This seed pulse will be stretched and amplified in several stages of optical parametric amplification to a final energy of the order of 400mJ. The final pulse will then be recompressed to a pulse duration of the order of 100fs to give a 4 TW output pulse. The proposed system design and initial development tests will be presented and discussed.

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